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ABSTRACT

Unlike those of several of it major economic competitors, the U.S. system of preparation for work stresses educational attainment rather than qualitative standards or occupationally specific assessments of knowledge or skills. The resultant emphasis on longer education produces a more qualified work force, but the quest for longer schooling has not come cheaply. Spending figures suggest that inefficiency rather than insufficiency is a prime culprit of U.S. educational deficiencies. The evidence indicates that factors other than education also enhance economic growth. The causes of poor student performance continue to be intensely debated. Poverty and discrimination have been found to hinder educational and job opportunities significantly. Increased attention to basic skills rather than further specialization would increase overall economic flexibility and the career adaptability of individual workers. Labor shortages in specific occupations are more difficult to forecast than are broader skill deficiencies. Current explanations used by various education commissions downplay the pervasive influence of poverty and family deterioration. Employers are not devoting large amounts of money to worker training. The adoption of national achievement standards at each level of schooling is recommended. (52 endnotes) (YLB)

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Got to Learn to Earn: Preparing Americans for Work

by Sar A. Levitan and Frank Gallo

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Education may enrich the quality of life, but Americans believe that its primary purpose is to prepare their children to attain good jobs and financial security.[1] Two-thirds of high school graduates pursue postsecondary education, involving a substantial investment of time and money. In recent decades, the U.S. system of preparing people for work has become increasingly beset with difficulties. While absolute and per capita investment in education has risen, student test performance in a variety of subjects is below the levels of three decades ago. On international educational achievement tests, American youngsters perform last or close to it among the industrialized democracies. Basic educational deficiencies may contribute to the narrowing U.S. lead in productivity over our competitors, and together with family breakdown, are also partly responsible for rising income inequality and persistently high poverty rates. Ironically, despite record labor force participation rates and sustained economic growth during the 1980s, income inequality widened and the number of poor increased.

Simultaneously growing spending and shrinking achievement indicate that Americans are not getting their money's worth for their educational investments. Additional funds may yield marginal improvements, but spending is no substitute for such critical factors as time spent on homework, which has fallen precipitously since 1960. The American system of preparation for work is flawed by encouraging the accumulation of credentials rather than the achievement of knowledge and skills. Given high occupational mobility rates and the effect of technology in reshaping skill requirements, individual acquisition of diverse skills is probably more appropriate than excessive specialization. Mandatory national standards, an idea now favored by most Americans, are necessary to monitor and continually improve performance.

Education constitutes the principal investment of time and money in preparation for work. Apparently taking for granted their schooling, however, workers questioned believe that the skills picked up through previous or current jobs are as important as education. Individuals accumulate most job-derived skills through routine work experience rather than formal on-the-job training, which is infrequent and of brief duration. The continuing rising investment in education as a means of preparing individuals for work is more readily described than explained. The development of the American system of education and training, like that of most other nations, reflects evolving tradition rather than planning. In addition to education and training, many other factors play a role, directly or tangentially in preparing Americans for the workplace. Accordingly, this paper includes a discussion of the education/productivity connection, the role that poverty and discrimination play in impeding lifetime work careers, and the presumed prevalence of occupational shortages.

The Evolving American System

A half century ago the average adult had only an elementary school education and regarded this as sufficient career preparation. Many elderly Americans left school at age 14 for their first full-time job. The movement during the 19th century to educate the "children of artisans and toilers of the soil" initially reflected moral rather than work-related concerns. By the last quarter of the 19th century the notion of using education to prepare individuals for work gained

acceptance. Between 1910 and 1940 the proportion of 14 to 17 year-olds attending school leaped from 14 to 75 percent. As American living standards rose, the necessity for children to earn wages lessened. Growing high school attendance rates were probably a voluntary development, because child labor and compulsory school attendance laws were sporadically enforced, and state mandates requiring school attendance beyond age 14 followed rather than preceded burgeoning high school growth.

The expanding number of managerial, professional and miscellaneous office jobs required longer education, or necessitated the literacy or numeracy skills taught by schools. Consequently, parents and youngsters viewed education as a means of upward mobility, and paid for additional schooling directly or by supporting expanded public institutions. Employers used educational attainment as a ready means to screen applicants, but committed relatively little resources to worker training.

High schools had essentially achieved their current form more than half a century ago. Subsequent mass unemployment during the Great Depression further boosted high school enrollment, as did the 1938 Fair Labor Standards Act, which set a minimum age of 16 for employment in most occupations. By the end of World War II, high school attendance was a normal part of growing up. Following the war, the GI bill enabled millions of veterans to afford a postsecondary education. Rising incomes, massive governmental subsidies and an almost universal belief that upward mobility required longer schooling made college attendance as common by the late 1960s as high school had been two score years earlier.

Acquisition of education and training

It is difficult, if not impossible, to distinguish work-related training from education or even from ordinary life experiences. Children taught to cook at home are normally not being prepared for a job, although those who become paid cooks will certainly

use these lessons. Similarly, all college students are incidentally fulfilling teaching prerequisites, although few enter that profession. According to the latest U.S. Bureau of Labor Statistics survey, respondents who needed training listed informal training as a source of equal importance with schooling (table 1). Some workers undoubtedly take their school learning for granted and therefore do not regard it as preparation for a specific skill.

TABLE 1. Most workers reported that they either needed no specific training for their job, or else picked it up informally on or off the job (1983).

	Needed training	Source of training[1] (% of those needing training) Informally on or off the job	Formal company program	School
Total	55%	56%	18%	55%
Professional	93	27	10	88
Technicians	85	40	16	68
Executive, administrative and managerial	71	59	17	61
Precision production, craft and repair	65	74	26	25
Administrative support	57	56	12	58
Sales	43	72	28	35
Machine operators, assemblers, and inspectors	37	78	16	16
Transportation and material moving	36	86	22	6
Service	36	56	25	36
Handlers, equipment cleaners, helpers and laborers	16	88	13	13
Private household	8	100	13	25

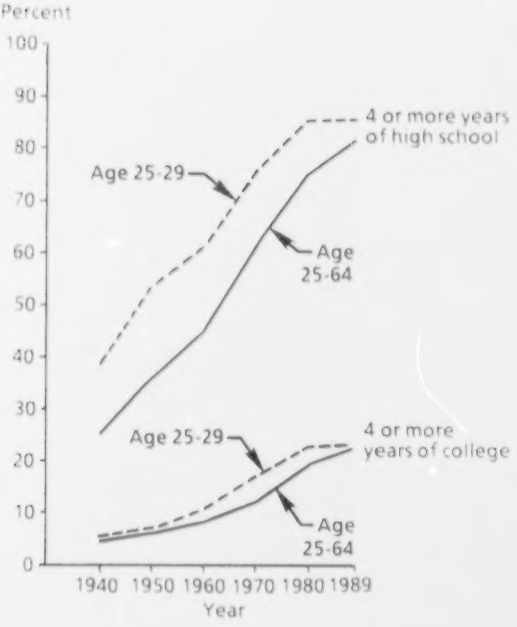
[1]Total exceeds 100 percent because respondents reported an average of 1.3 sources of training.

Source: U.S. Bureau of Labor Statistics, *How Workers Get Their Training* (Washington: Government Printing Office, February 1985).

Measured by length of schooling, Americans are one of the most educated people in the world, and have been for a century or more. Today 85 percent of 25 to 29 year-olds have completed at least four years of high school, and nearly a quarter have finished four years of college. The 25 to 64 year-old working age population now possesses almost the same educational

attainment level as incoming cohorts, and consequently the attainment level of the workforce is not likely to increase in the 1990s (figure 1). By 1987, 45 percent of 25 to 64 year-olds had attended postsecondary educational institutions, including 7 percent with post-baccalaureate degrees (figure 2).

FIGURE 1. The rise in educational attainment among the working-age population has tapered off.

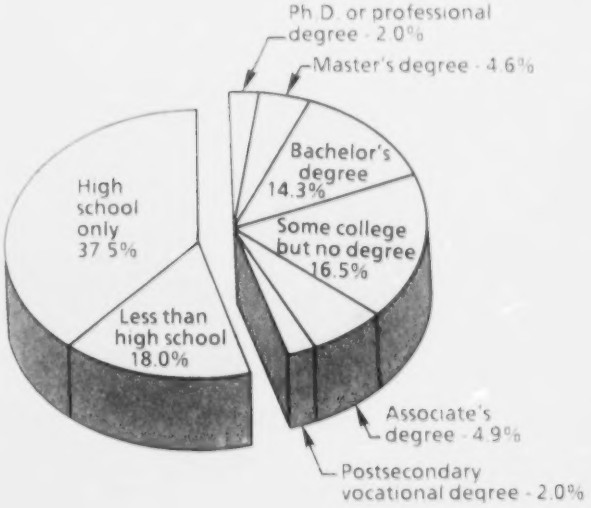


Source: U.S. Department of Education, *Digest of Education Statistics, 1990* (Washington: Government Printing Office, December 1990), p. 17.

Unlike several of our major economic competitors, the American system of preparation for work stresses educational attainment or "aptitude" tests rather than qualitative standards or occupationally-specific assessments of knowledge or skills. The emphasis on longer education has unquestionably produced a more qualified workforce, but also encourages

educational inflation and enables some individuals to obtain credentials by accumulating "seat time" rather than skills. As Professor Eli Ginzberg of Columbia University observed, anyone who outlasts 16 years of educational bureaucracy is conditioned to its workplace counterpart. But from the employers' perspective, the lack of educational standards means that credentials present an uncertain value, which in turn promotes educational inflation because employers try to minimize their hiring risk by stressing lengthier attainment levels. Governmental policy has greatly influenced rising educational attainment, through an extensive network of public postsecondary schools, grants and loans, tax subsidies, and the educational benefits provided through military employment.

FIGURE 2. Nearly half of 25 to 64 year-olds have attained more than a high school education (1987).


Ph.D. or professional degree - 2.0%
Master's degree - 4.6%
Bachelor's degree 14.3%
Some college but no degree 16.5%
Associate's degree - 4.9%
Postsecondary vocational degree - 2.0%
High school only 37.5%
Less than high school 18.0%

Source: U.S. Bureau of the Census, *What's It Worth? Educational Background and Economic Status: Spring 1987* (Washington: U.S. Government Printing Office, October 1990), Current Population Report, Series P-70, No. 21, p. 7.

The trend toward longer schooling is international in scope, and our major economic competitors, especially Japan, have narrowed the U.S. lead in attainment (table 2). In fact, among 25 to 34 year-olds, Japanese match the U.S. in attainment. However, post-baccalaureate studies remain much more common in the U.S. than in other nations. The U.S. lead in educational attainment is inflated by international statistical agencies' practice of excluding postsecondary vocational schooling, common in Japan and Germany. Because of the recent rise in vocational studies at U.S. community colleges, the distinction between "higher education" and postsecondary vocational schooling has diminished.

TABLE 2. Americans' educational attainment exceeds that of our major economic competitors, although our lead is diminishing.

Educational credential	U.S. (1988)	Japan (1987)	Germany (1987)	U.K. (1987)
Age 20 or older				
High school diploma	77%	63%	69%	41%
Some college	48	20	NA	NA
College degree	30	13	12	10
Age 25 to 34				
High school diploma	86	91	83	46
Some college	53	39	NA	NA
College degree	24	23	18	10

Source: Organisation for Economic Co-operation and Development, *Education in OECD Countries, 1986-87* (Paris: OECD, 1989), p. 86; OECD, *Employment Outlook* (Paris: OECD, July 1989), pp. 54-5.

Back to school

In addition to prolonging the period of schooling during their youth and young adulthood, Americans are increasingly returning to school later in life. Between 1957 and 1984, adult education enrollment rates doubled for 30 to 44 year-olds. Since the mid-1970s, about a tenth of 25 to 29 year olds have attended school in the fall term. A much larger proportion of individuals take at least one course during any given year. In 1984 more than two thirds of American adults enrolled less than full-time did so for job-

related reasons. About a sixth of those taking courses for job-related reasons are preparing for a different occupation.

The increased proclivity of adults to return to school probably enhances their productivity and upward mobility by augmenting their skills. This would be especially important for workers with poor school records and those stuck in unrewarding occupations. However, the deck is stacked against individuals who need and could most benefit from further education. Individuals with relatively more education and income and higher status jobs are most likely to return to school. In 1984 roughly two fifths of women and a third of men in the prime working years (age 25 to 54) who already possessed a postgraduate education took additional courses, compared to about one in twenty with less than a high school education. As a result, the skills gap which exists in the immediate post-school years appears to progressively widen over time.

Government policy has exacerbated the difficulties of disadvantaged individuals desiring to return to school. Financial aid through grants and loans, which dominates federal postsecondary assistance, is geared toward younger students. Older individuals, who support themselves or their families, usually enroll part-time, which automatically disqualifies them for Pell grants and Stafford loans, the two largest federal sources of aid. In addition, various income tax provisions which promote educational investment for adults are skewed toward individuals with higher incomes.

Dollars and Credentials

The persistent quest for universal and longer education did not come cheaply, although the connection between education and training and economic growth is far from unequivocal. A skilled workforce undoubtedly stimulates growth, yet other factors also play a major role. U.S. productivity remains well ahead of our competitors, although the gap is steadily closing. Productivity growth has been sluggish since the early 1970s, although the average educational attainment of the workforce grew strongly. Given such seeming paradoxes, pinpointing the impact of longer education is necessarily speculative. The displacement of U.S. preeminence in many important industries by foreign competition has generated concern among policymakers and the American public, but corrective measures to counteract the declining competitiveness of American industry have been minimal.

Investment in education

Inadequate spending, often blamed for educational inadequacies, is certainly not responsible for declining achievement. The United States investment in education continued to grow in the 1980s even as other social spending lagged. In the mid 1980s (the latest comparative data available), the U.S. led the largest industrial democracies in the proportion of gross domestic product (GDP) devoted to education:

U.S.	6.8%
France	6.6
Japan	6.5
United Kingdom (public only)	5.0
Germany	4.5

American educational investment is heavily weighted toward postsecondary schooling, and the U.S. devoted a smaller share of gross domestic product (GDP) to elementary and secondary education than any of the above countries.[2]

An objective standard to gauge the appropriate societal investment in education has not been devised,

but poor test performance persuasively suggests that Americans are not getting their money's worth. Educational investment has remained profitable for individuals, but this condition may coexist with an overall inflation of educational credentials. International comparisons are equally problematic. Although both education and training prepare individuals for work, the latter category is measured poorly if at all. The U.S. investment in on-the-job training of young workers trails that of Germany and probably Japan. Expenditure data of course exclude student homework, a critical educational input in which the U.S. is sorely lagging. Aggregate spending as a proportion of GDP is a crude measure of educational investment. Relatively affluent nations predictably devote smaller shares of GDP to basic societal necessities, which now include elementary and secondary education. Other spending indicators engender equally difficult obstacles. Adjustments for purchasing power parities reflect consumer purchases, and may be ill-suited to gauge educational expenditures. Even if the necessary adjustments were available, educational spending may have only a limited connection with educational quality.

U.S. educational spending as a proportion of gross national product peaked in 1970 at 7.5 percent, and dropped to 6.7 percent by 1989. However, if educational investment is adjusted for the decline of the population in the prime schooling years, spending has continued to grow—no matter what indicator is used to adjust for inflation. Therefore, inefficiency rather than insufficiency is a prime culprit accounting for American educational deficiencies. In 1989 estimated spending per elementary and secondary school-age child was $4900 (1990 dollars), more than twice the level of the early 1960s and 25.9 percent more than in 1980 (table 3).

TABLE 3. Elementary and secondary school expenditures per school-age child grew by 26 percent during the 1980s (1990 dollars).

	Expenditure* (billions)	% of GNP	Population aged 5–17 (millions)	Spending per school-age child
1961	$107.2	3.7%	45.3	$2369
1965	137.4	4.0	49.9	2756
1970	173.6	4.7	52.6	3301
1975	182.5	4.7	51.0	3576
1980	184.0	4.1	47.2	3895
1985	198.8	4.0	45.0	4421
1989	221.9	4.1	45.3	4902

*Adjusted using GNP implicit price deflator for state and local government purchases.

Sources: U.S. Department of Education, *Digest of Education Statistics, 1989* (Washington: Government Printing Office, December 1989), pp. 21, 29–30, and national income accounts.

Although the college-age population has dropped since the 1970s, expenditures by postsecondary institutions have kept pace with GNP:

	1990 dollars (billions)	% of GNP
1961	$ 48.1	1.7%
1965	65.7	2.2
1970	99.3	2.7
1975	106.1	2.7
1980	115.6	2.6
1985	132.3	2.7
1989	147.4	2.7

Because the age of college enrollees has expanded significantly, adjusting expenditures for the college-age population is problematic, but such adjustments indicate that per capita postsecondary educational investment in the 1980s may have outpaced the growth in elementary and secondary schools.

Education and economic growth

Today it is widely assumed that education is a prerequisite for national and individual economic progress. In the United States this notion dates back at least to Horace Mann, one of the founding fathers of the American mass education system during the mid 19th century. Mann argued, "That political econ-

omy...which busies itself about capital and labor, supply and demand, interests and rents, favorable balances of trade, but leaves out of account the element of widespread mental development, is nought but stupendous folly." In the early 20th century economist Irving Fisher first suggested that investment in education forms human "capital." "Resources put into schooling," he reasoned, "are...investments in the acquisition of potential income streams, whether looked at from the individual or from the societal points of view. This is a kind of capital formation."[3] But not until the early 1960s, following the seminal work of Theodore Schultz, did economists attempt to quantify the returns to human capital.

Quantifying the magnitude of the relationship has proved elusive. By providing people with more income and free time to pursue schooling, economic growth may enhance educational attainment rather than vice versa. The means of organizing work may be as important as the quality of the workforce. The industrial revolution, which brought about the first major historical upsurge in productivity, preceded the rise of mass education. Although Japan and Germany, the two other largest industrial democracies, have narrowed the productivity gap between themselves and America, the U.S. lead remains large:

Gross domestic product per worker (U.S. = 100)

	Japan	West Germany
1960	24	50
1970	47	62
1980	64	76
1990	77	79

U.S. productivity is almost twice that of Japan's (100 vs. 58) if the comparisons are adjusted for hours worked.[4] The organization of work is, however, unquestionably a function of workforce talent. The rapid economic growth of Japan and Germany following the major destruction of their physical capital dur-

ing World War II underscored the importance of workforce quality.

Considering these strong caveats, the evidence indicates that education enhances economic growth. Because it has proved impossible to directly measure education's effect on economic growth, either at the individual or national level, economists have utilized the indirect method of growth accounting. Analysts have quantified the contribution of the more easily measured factors of production (physical capital, labor costs and rent), and heroically assumed that the unexplained residual growth is due to a more skilled workforce, technical innovations, and more efficient production methods—all of which are partly attributable to education. Professor Garth Mangum of the University of Utah observed that if truckdrivers attempted to measure the factors contributing to productivity growth, education would no doubt play a lesser role than economists believe.

Economists have estimated that rising investment in education has by itself accounted for between 11 and 34 percent of economic growth in the half century between 1930 and 1980, depending on the time period studied and differing estimation methods:

Economist	Period studied	Education's contribution to growth
Edward Denison	1929–57	23%
	1948–73	15
	1973–81	34
Theodore Schultz	1929–57	16.5 to 20
Dale Jorgenson	1948–73	11

An additional share of growth is attributable to applied knowledge, often a product of education. Growth accounting studies of other nations similarly indicate the economic benefits of education.[5] However, slowing productivity growth among the advanced industrialized democracies since the 1973 OPEC oil embargo accompanied by rising educational attainments has somewhat dampened faith in additional

doses of education as an elixir for rapid economic growth. The sudden slowdown of productivity growth in 1973 renders workforce quality an unlikely culprit for the decline, because from one year to the next the characteristics of the workforce change little.

Economic returns of education to individuals

From an individual's perspective the economic value of education is bountiful, although much of this return is apparently attributable to credentialism rather than capability. In 1987 workers with bachelor's degrees earned twice as much per month as those who did not continue beyond high school, and four times more than those who did not complete high school (figure 3). This educational "bonus" decreased during the 1970s, but rose during the next decade to levels above those of the early 1970s.[6]

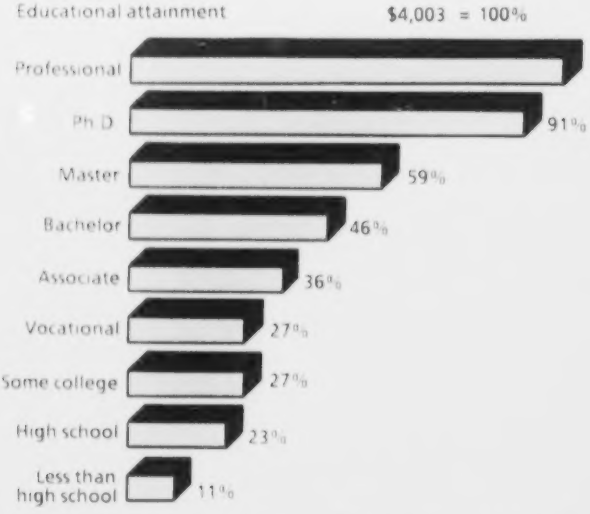


FIGURE 3. Educational attainment pays off handsomely (1987 average monthly earnings).

Source: U.S. Bureau of the Census, *What's It Worth? Educational Background and Economic Status: Spring 1987* (Washington: U.S. Government Printing Office, October 1990), Current Population Report, Series P-70, No. 21, p. 4.

Earnings account for about two-thirds of aggregate income. However, since almost all men ages 25 to 54 have worked in the postwar period, and because income data are much more extensive, they are used here as a proxy for earnings. Granting the lack of statistical rigor, the data provide insights into the economic rewards of education by tracking the income of five age cohorts (table 4). The income of 25 to 34 year-old college graduates equalled or exceeded that of 45 to 54 year-old men with only a high school diploma who have had two decades more work experience.

TABLE 4. A college education has become not only more lucrative, but almost necessary to avoid stagnant or declining career earnings.

Men's income by educational attainment (1990 dollars)

	Elementary school	1–3 years high school	High school only	1–3 years college	College graduate
25–34 years old					
1949	$10,269	$13,852	$15,593	$15,780	$17,864
1958*	12,562	17,794	19,513	20,908	24,850
1969	17,615	22,202	26,565	28,373	33,929
1979	14,144	19,398	25,222	26,892	30,635
1989	11,004	14,728	21,081	24,243	31,410
35–44 years old					
1949	—	16,037	17,778	19,994	25,948
1958*	14,548	19,638	22,207	26,232	32,180
1969	20,026	26,104	30,340	36,211	46,578
1979	17,984	21,940	31,439	35,190	45,494
1989	12,659	16,609	26,351	31,840	43,084
45–54 years old					
1949	—	16,194	18,606	20,685	28,002
1958*	14,269	18,822	22,614	26,498	38,378
1969	20,192	25,895	30,383	36,015	48,432
1979	18,997	26,227	32,679	35,630	49,452
1989	15,073	21,231	29,621	36,130	50,594

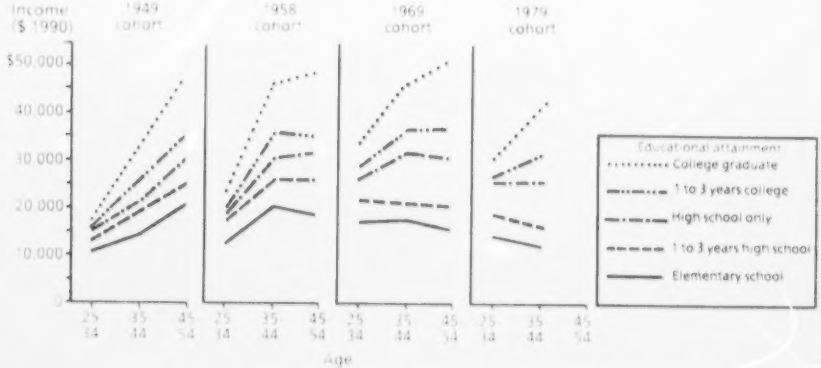
*1959 income data not available

Source: U.S. Census Bureau, 1950 Census of Population and Current Population Reports, Series P-60, various years

The income differential based on educational attainment rose during the past decade. Recent college

graduates are now quickly reaping a magnitude of increased income above their less-educated contemporaries that previous generations of college graduates took decades to attain. At the other end of the educational spectrum, workers are increasingly facing the prospect of minor income gains or even declines as their careers progress (figure 4). In contrast, young men with no more than a high school education in 1949 nearly doubled their real average income by the time they reached middle age.

FIGURE 4. Educational attainment increasingly pays off as men progress in their careers.



Sources: U.S. Bureau of Census, 1950 Census of Population and Current Population Reports, Series P-60, various years

Educational attainment is also inversely related to unemployment during good times, and more so during recessions. Between 1970 and the early 1980s, the unemployment rates of high school graduates were double those of college graduates, a ratio that rose to 3:1 during recessions. The benefits of a college education have continued to increase since the 1981–2 recession, and by the end of the 1980s equalled the differential previously attained during recessions.

College graduates are also more likely to be employed than those with less education. Women are more likely to be in the labor force today than in 1970 regardless of educational attainment, while men with

high school diplomas or less schooling are less likely to be working or looking for work than their counterparts in 1970. Other industrialized democracies have experienced trends similar to U.S. patterns with regard to education and unemployment, but a weaker connection between education and labor force participation.

These income and employment differentials by no means imply that the entire population would benefit from postsecondary education. The educational process not only provides skills, but also sorts individuals by ability or credentials. Unemployment, earnings, and productivity trends do not correlate closely with rising educational attainments. In the past a high school diploma opened doors to most jobs that now require a college degree. This fact may indicate that a certain amount of inflation has accompanied rising American educational credentials. Educated workers are presumably more productive, but so far reliable productivity measures at the individual level remain elusive.

The fact that overall income inequality has grown while educational attainment differentials have narrowed indicates that factors other than education have significantly influenced differentials in wage trends. Wage inequality within groups possessing the same amount of education and work experience grew steadily from the late 1960s until the mid 1980s, when it leveled off. The earnings gap between white and black college graduates widened between 1979 and 1989.[7] A college education has not protected all sheepskin bearers from the effects of growing earnings inequality. In 1986 one of nine male college graduates earned less than the poverty line for a family of four. In the two decades following World War II low earners experienced greater wage increases than high earners—a development little influenced by rising educational attainments. Rising international competition and employers' propensity to distinguish ability differences among individuals of equal educational attain-

ment have been offered as explanations for growing wage inequality, but hard evidence is lacking.

Various attempts have been made to isolate the value of education from family income, race, gender, tested performance, and the type and quality of the coursework or training obtained. Most research indicates a clear payoff to a baccalaureate or higher degree, even after accounting for various background factors. Ability—as measured by test scores—tends to pay off modestly but increasingly as individuals progress in their careers. However, possession of credentials apparently outweighs ability differentials.[8] The importance of credentials is bolstered by examining occupational trends as men progress in their careers. Only one-sixth of men with high school diplomas rise to managerial and professional jobs by the time they reach their peak earning years, and two fifths remain in the four lowest paid occupational categories. In contrast, half of college graduates begin their careers in managerial and professional occupations (table 5).

TABLE 5. By the time men reach their peak earning years, four of ten high school graduates remain in the four lowest paid occupations, while most college graduates are managers or professionals (1988).

	full-time median weekly earnings (1988)	Schooling					
		12 years			4 or more years college		
Age		16–24	25–44	45–64	16–24	25–44	45–64
Total	$485	100%	100%	100%	100%	100%	100%
Four highest paid occupations	—	56	51	57	79	88	91
Managerial and professional	731	4	10	16	48	64	73
Technicians	570	1	2	2	8	5	2
Sales	505	*	9	11	18	14	13
Precision, production, craft and repair	488	26	30	28	5	5	3
Four lowest paid occupations	—	42	49	42	20	12	9
Administrative support	440	6	5	*	*	4	3
Operators, fabricators, and laborers	378	38	30	21	6	4	2
Service	320	15	10	10	6	3	2
Farming	265	5	4	4	1	1	1

Note: 16–24 category excludes school enrollees.

Source: Unpublished BLS data from the 1988 Current Population Survey

A college degree reaps substantial returns. Men who attended prestigious colleges earned more than other college graduates (women's earnings have not yet been studied). The differential appeared immediately and persisted for at least another eight years. However, college status influenced earnings much less than the choice of major or attainment of a postgraduate degree.[9] Possessors of a baccalaureate in engineering, health, business, science or math received the highest salaries, while humanities graduates did little better and education graduates did no better than those with high school diplomas only.

A 1986 follow-up of 1972 high school seniors concluded that individuals with postsecondary credentials other than a college degree generally earned more than high school graduates. The higher earnings were due to increased working time rather than higher wage rates. But men with sub-baccalaureate vocational certificates in industrial occupations and women with associate degrees in business (often secretarial) studies did even worse than high school graduates. Individuals who reaped no benefit or in fact did worse in spite of postsecondary study probably suffered monetarily because they trained for low-paying occupations.

Until the 1980s the prevailing view was that high school vocational track graduates did no better and possibly worse than the academic or general track students who did not pursue postsecondary education. Recent research indicates more favorable short-term benefits from vocational education. However, within roughly 5 to 10 years after graduation, former vocational track students appear to be earning little more than nonvocational graduates after adjusting for background characteristics.[10] The minimal level of skills required for the jobs targeted by high school vocational instruction probably explains these diminishing returns.

Fixed standards are not available to measure the quality of employment-related education. Because workplace needs are subject to continuing flux, and because scholastic test scores do not necessarily reflect workplace competence, it is extremely difficult to reach a consensus on the necessary workplace skills. A few decades ago managers and professionals commonly disdained typing as a second-class secretarial skill, but currently half of them peck at computer keyboards. Test scores correlate reasonably well with school—but not necessarily with job—performance, as borne out in assessments of two of the most widely used tests. Eighty percent of soldiers who failed the Armed Forces Qualifications Test performed satisfactorily on the job, and less than a fifth of General Aptitude Test Battery scores correlated with supervisors' ratings.[11] The connection between scholastic and work skills may be tenuous even for job duties similar to schoolwork. For example, a group of milk truck drivers relying upon mental arithmetic made almost no pricing mistakes, but erred frequently on similar calculations for a pencil and paper test.

A final difficulty is that longer education not only augments knowledge, it also presumably sorts out the relatively more talented individuals in society. Therefore, comparisons of college students in a era when few attended with students in a generation when college attendance is widespread may be comparing apples and oranges. For this reason, the oft-cited Scholastic Aptitude Test (SAT) results are poor measures of trends. Given these caveats, it is still reasonable to assume that until the 1960s rising educational attainment produced an increasingly skilled workforce, when progress slowed for reasons still heatedly debated.

What do Americans know?

An examination of the skill deficiencies of American students and adults is deeply troubling. Even a high school diploma is no guarantee of functional lit-

eracy, and illiteracy rates for the youngest adult cohort indicate no progress over older generations. In 1982 the U.S. Education Department estimated that 13 percent of adults aged 20 or older were functionally illiterate—meaning that they would have difficulty comprehending this sentence. Included in this group were 5 percent of 20 to 39 year-old native English-speaking adults with a high school diploma.

The vast majority of high school students and young adults possess no more than minimal literacy and numeracy skills. Three fifths of 17 year-olds and nearly half of 21 to 25 year olds could not describe the main point of a high school text level passage, nor answer simple questions about its contents. No more than a fifth of either age group could correctly answer relatively basic questions about a brief text at the level of a news magazine article. Half of 17 year-olds could not answer simple questions concerning percentages or graphs, determine the area of a rectangle, or solve simple equations. Only 6 percent could handle basic algebra. Among 21 to 25 year-olds, more than a fourth could not perform simple addition and subtraction to balance a checkbook, three-fifths could not add a two-item lunch bill and calculate a 10 percent tip, and four-fifths could not make out the meaning of a bus schedule. Basic knowledge deficiencies abound even among college students.[12] Nearly a third of 1989 college freshman enrolled in remedial education classes.

An analysis of responses to knowledge questions (including contemporary public issues, history, civics, and geography) in public opinion polls between 1950 and 1970 indicated that level of education influenced knowledge significantly but age cohort had little effect. Not surprisingly, expansion of educational attainment apparently augmented knowledge as well. But since 1970 individuals aged 18 to 29 have performed more poorly than older age groups, despite equivalent or higher educational attainment levels.[13]

The U.S. National Assessment of Educational Progress (NAEP) has tested 17 year-olds' reading, writing, math, science and civics knowledge since the 1970s. The findings are generally, but not always, consistent with other evidence of achievement decreases in the 1970s. Although the score changes have been small, the NAEP tests indicate that due to improvements in the 1980s the most recent student scores matched the early 1970s performance levels in math, writing and civics, and exceeded them in reading, but science scores remained well below those of 1970.[14] Despite the improvements, student performance remains below the levels of 1960.

Not only does the knowledge of today's student lag behind those of a generation ago, but U.S. students have performed last or close to the bottom compared with their counterparts in other industrialized democracies on the two rounds of international tests administered to date. A separate 1988 international assessment tested 13 year-olds' math and science knowledge in the United States, United Kingdom, Korea, Ireland and Spain. Again, U.S. students performed last or very close to it; Korean students recorded the highest achievement.[15] Apparently the rise in U.S. test scores in the 1980s has not improved the performance of American students relative to other nations. On the other hand, compared to adults in the European Community and Canada, Americans placed near the top of the list in science knowledge.

The international tests have generated widespread publicity, providing impetus for the educational reform movement's emphasis on educational achievement rather than attainment. Clearly the inferior performance of American students is cause for concern, although the significance of the score differentials may be questioned. In contrast to the American educational system, the elementary and secondary student in Germany and Japan, for example, are subjected to continuing rigorous testing which determine not only their advancement in school but also their

lifetime work careers. It should therefore not be surprising that German and Japanese students score higher than American children on identical tests. In addition, the methodology and construction of the comparative tests are beset with problems, at least for 12th graders, making the findings problematic.[16] Even considering the flaws associated with comparative international testing, the data strongly point to the inferior achievements of American students.

Factors contributing to the decline

The causes of poor student performance have been intensely debated. The deteriorating structure of the American family and heavy TV viewing undoubtedly impair achievement, but neither factor correlates closely with declining test scores in the 1960s and 1970s. The decline was well underway before divorce and out-of-wedlock births became common, while extensive TV watching predated the test score decline and has accompanied the more recent improvements. The expanding proportion of minority students, who have tended to fare more poorly in school than whites, better coincides with falling test scores in the 1970s, although in the 1980s blacks narrowed the achievement gap with whites. Reviewing these as well as other factors, the U.S. Congressional Budget Office found no clear single culprit or group of culprits accounting for test score declines.[17]

Eroding school standards and sharply reduced homework impair educational achievement. Learning requires practice and individual effort, but American students do regrettably little reading, writing, mathematical, or science work on their own. In 1988 nearly a third of seniors read five or fewer pages daily for school (including all school and homework combined), and 85 percent read less than 20 pages daily. Reflecting slackening school demands, three quarters of twelfth graders were assigned to write no more than one three-page paper for social studies or history classes.[18]

The average amount of time that high school seniors spent on homework dropped from 9 to 4 hours weekly between 1960 and 1980. In 1960 the average senior spent twice as much time on homework as on paid work, but only 20 percent as much two decades later. The school reform movement has boosted homework somewhat, but in 1988 a third of 17 year-old students still did no homework on an average weekday:

Daily homework	1980	1988
None assigned	31.0%	20.8%
Assigned but not done	12.6	13.4
Less than 1 hour	23.9	27.8
1 to 2 hours	22.8	26.0
More than 2 hours	9.7	12.0

Adults have also reduced their leisure-time reading, suggesting that workers have less opportunity to augment their knowledge. Weekly reading time of 18 to 64 year-olds dropped by about a third, from 4.2 to 2.8 hours, between 1965 and 1985. The proportion of adults who read a newspaper on the day prior to the survey dropped from 73 to 55 percent over the same span. Young adults are particularly less likely to read newspapers, auguring poorly for the future.[19]

More lenient college entrance requirements no doubt lightened high school workloads. Many colleges in the 1960s and 1970s scaled back math and science requirements, and most dropped foreign language requirements altogether. A profusion of high school course offerings enabled students to enroll in elective courses which were often less demanding than the traditional classes they replaced. However, during the past decade standards have been tightened somewhat. As a result of the 1980s school reform movement, the average public school graduate has completed about 2.5 more courses than his or her counterpart of two decades ago. Science and math courses account for about 40 percent of this net increase, but a third of

high school students graduate without studying algebra, and only two fifths complete a course in chemistry.

The knowledge deficiencies of workers are not entirely attributable to flaws in the American system of preparing people for work. Poverty and family breakdown are powerful impediments to educational achievement and workplace preparedness. The proportion of children living in poverty has climbed during the past two decades, reaching 20 percent by 1989. The rising incidence of divorce and out-of-wedlock births since the 1960s has become increasingly intertwined with poverty, by creating economically precarious single parent families. If present trends continue, nearly 60 percent of all children will spend some time in a single-parent family before reaching adulthood, and 90 percent of black children are expected to do so. Many children from such families are ill-prepared for an education and are candidates for failure by the time they enter school. "A hungry child," Eli Ginzberg stated, "is not able to concentrate or to learn."[20]

Poverty and limited family incomes during the formative years significantly hinder subsequent educational attainment. Less than 1 in 12 individuals who were 9 to 17 years old in 1968 and spent part of their late childhood in poverty graduated college by age 25.[21]

	Educational attainment at age 25	
	High school diploma	College degree
Total	88%	26%
Annual family income (1986 dollars)[1]		
Under $25,000	75	10
$25-50,000	91	26
Over $50,000	98	50

(chart continued)

Poverty status

Poor at least one year	71	8
Never poor	94	33

[1]Average family income from 1968 until child turned 18.

Among eighth graders in 1988, nearly a third of those in the bottom quarter of the socioeconomic distribution (ranked by parental income, educational attainment and occupational status) had already repeated at least one grade, compared with 8 percent of those at the top end. Low income particularly afflicts black children, 80 percent of whom experience poverty before maturation.

Statutory and overt racial and gender discrimination has diminished during the last three decades, yet continues to restrict educational and job opportunities. Discrimination's legacy has left an alarming incidence of poverty among minorities. Housing discrimination remains prevalent, as repeatedly demonstrated by the use of black and white "testers" seeking to rent or purchase accommodations in white neighborhoods. Because local revenue provides roughly half of elementary and secondary school financing, low income areas face obvious impediments to school quality. Finally, employment discrimination has exacerbated minority unemployment and concentrated minorities in less desirable jobs. Thus blacks and Hispanics have less access to job training or work experience which would enhance their preparation for better jobs.[22]

School and Work

Since World War II Americans have pursued increasingly specialized educations. However, the persistent and probably ingrained pattern of occupational mobility among American workers, together with changing but unpredictable demands for specific skills, suggests that a thorough grounding in the most important subjects—English, math and science—would better facilitate both adaptability and upward mobility. According to the federal Commission on Achieving Necessary Skills, "The ability to put knowledge to work [is a key] to the future of our young people, the success of our business and the economic well-being of the nation."[25]

Inadequate basic skills appear to be a more serious problem than an alleged runaway pace of change due to technological innovations, for which there is little evidence. Contrary to periodic alarms, supply shortages in particular occupations occur rarely, and are much less troublesome than the opposite problem of unemployment. The future supply of engineering and scientific professionals may be of concern, but this is by no means certain.

Combining school with work

Americans start working at an early age. Eighty percent of eighth graders questioned in spring 1988 had worked for hire outside the home; half of these performed babysitting or lawn work. Surveys indicate that this trend dates back at least to the 1950s. Most such work is sporadic, but 1 of 11 employed eighth graders reported working more than 20 hours a week on their last job. Societal attitudes, reinforced by federal and state laws, have since 1938 prohibited or limited youngsters below age 16 from engaging in many occupations. Young people may not attempt to gain their first "career" job until completing schooling, but by then many have garnered years of work experience. Since World War II the proportion of students age 16 and over who also work has risen significantly,

particularly among women. Less than half-time employment may not interfere with schooling, and enhances future earnings. However, few jobs held by students—even at the postsecondary level—are related to their course of study. Some schools encourage paid work through cooperative education programs, which enroll roughly three quarters of a million students annually.[24]

Working less than 20 hours a week apparently does not adversely affect test performance, class rank, dropping out, or the likelihood of pursuing postsecondary education. Paid labor may reflect students' willingness to exert effort and to gain earnings, rather than their desire to find a substitute for school. Labor market experience may also bring home the fact that further education is often a prerequisite to economic advancement, a lesson often not learned in school itself. One in 10 employed students works a heavy schedule of 30 or more hours weekly. Their low performance in school is probably attributable more to enrollment in the vocational track than to work interfering with schooling. Increased student employment appears to have filled the void created by reduced homework, and not displaced it. Working is more likely a substitute for watching TV than doing homework. Employed male students spend about two hours less studying per week than nonemployed students (the difference for women is minor), but working students of both sexes watch about four hours less TV weekly than nonemployed students.[25]

Moderate employment while in high school appears to enhance future earnings, at least during the four years after graduation. High school graduates who worked 16 to 20 hours weekly while in school subsequently earned about 5 to 9 percent more hourly and 12 percent more annually than similar nonworking students.[26]

Like high schoolers, college students are increasingly prone to be in the labor force, which in part

reflects the increased proportion of students from lower income families and rising college costs (figure 5). In 1989 half of full-time college students below age 24 and 9 of 10 part-time students were in the labor force.

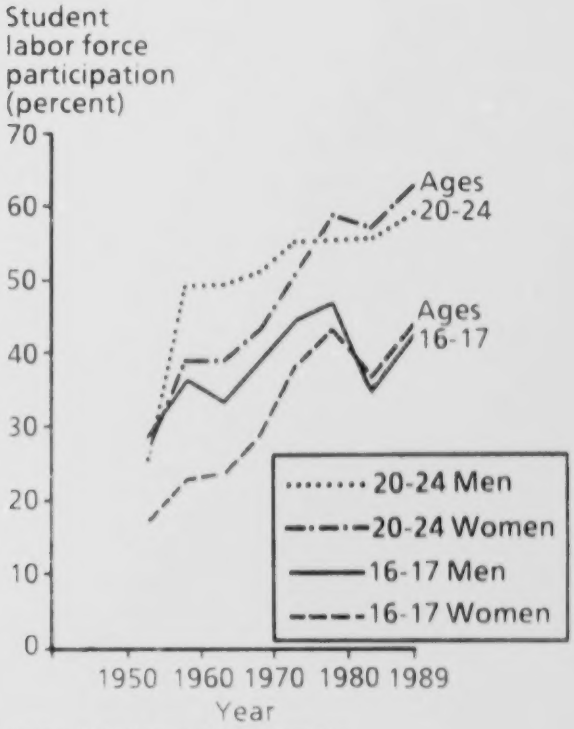


FIGURE 5. The labor force participation of high school and college students has increased during the past four decades.

Source: U.S. Bureau of Labor Statistics

As 1980 high school seniors progressed to their senior year in college, three-fifths of employed seniors remained in low level jobs, but one in four advanced during their summer work to professional or technical jobs. The share in professional or technical jobs during the academic year grew more modestly. It is unlikely, therefore, that many students are able to find work

related to their field of study while they remain in school. In fact, competition for professional jobs is often so intense that employers are able to "employ" students as interns without pay.

The explosion of retail and fast food establishments in recent decades has provided abundant employment opportunities for youth, and the availability of cars made work even more accessible. The malls, shopping centers, and fast food chains that dot the American landscape depend heavily on student labor. Rising postsecondary attendance rates have induced many students to begin work as soon as their age allows to meet future college costs. Given present limited homework demands, work while attending high school is on the whole probably beneficial, especially since the alternative is likely to be watching television or engaging in other activities that do not contribute to intellectual or physical development. Work experience undoubtedly provides students with more disciplined work habits and a practical knowledge of the labor market.

However, except for relatively scarce vocational and cooperative education programs combining school with work, students are customarily left on their own to obtain employment. The education system does not link students' work to the education program, or stress the importance of current schooling as preparation for future employment. Many noncollege bound school leavers, with or without a diploma, tend to flounder in the labor market or face unemployment because of limited grounding in work requirements, lack of job search skills, or inadequate skills generally.

As in the case of high school students, increased employment among full-time college students may be due to lessened academic demands. Because individuals at this age are more likely to have left the parental nest, work is necessarily more intertwined with schooling at the postsecondary than the high school level. They are therefore more prone to enroll part time.

Specialization versus generalization

The supply of specific skills is loosely connected with occupational demand. Except for computer instruction, during this century most coursework up to the end of high school has been influenced more by educational tradition and advances in knowledge than by changing workplace needs. Postsecondary specialization emanates almost entirely from student preferences, with occasional parental or school counselor guidance. For most jobs, potential students and trainees rely on their own assessment of future occupational prospects to choose a career, augmented directly or indirectly by government employment projections. Computer jobs exemplify the informal nature of this process. During the 1970s and early 1980s numerous students pursued computer training, enticed by relatively good pay and proliferating job openings. As the market became glutted, the pursuit of computer training lost its allure, and some analysts are now predicting that a possible decline in computer majors will produce future supply shortages. Some associations, particularly those of physicians and attorneys, have managed to exert partial control over occupational entry.

Because forecasts of the economy's long-term direction and preferences of workforce entrants are mostly guesswork, it is probably undesirable and certainly foreign to American values to impose controls on individuals' choice of training or study. Occupational vacancy data exist for only a handful of jobs, and given the inherently ambiguous nature of classifying occupations, improving our knowledge about occupational supply and demand would be daunting and possibly useless. Even a perfect assessment of short-term needs would have limited utility because students can hardly be expected to base lifetime decisions on current and perhaps fleeting opportunities. It would be more realistic and fruitful to promote the acquisition of skills pertinent to diverse occupations and necessary for upward mobility; however, no consensus exists on the nature of these skills.

The need for greater emphasis on diverse fundamental skills rather than increased specialization is indicated by school-to-work mismatches and high rates of occupational mobility. Although direct information on the school-work connection is available for only a few years after graduation, it appears that the fit between educational specialization and subsequent occupation is often quite loose. Half of the occupationally specific courses taken by 1982 high school graduates who did not pursue postsecondary education were unrelated to work three and one-half years after graduation:

	1985
Total	51%
Men	43
Women	61

Women were relatively better able to find related work because they prepared for the few traditionally female-dominated occupations. A high level of school-to-work mismatches also occurs among postsecondary vocational graduates.

One fifth of baccalaureate graduates employed full-time and not enrolled in school worked in jobs unrelated to their field of study a year after graduation, a trend which has remained consistent for at least three decades. To prepare for their careers, nearly half of the 34.2 million adults aged 25 to 64 with any postsecondary degree (from vocational to doctorate) acquired degrees in business or management, education, or health (figure 6). The distribution of degrees granted during 1988–9 indicates the increased popularity of business and management and engineering programs and the relative decline in education degrees. Baccalaureate bearers majoring in health, engineering, business, education, mathematics, computers, and physics most often utilized their educational training.

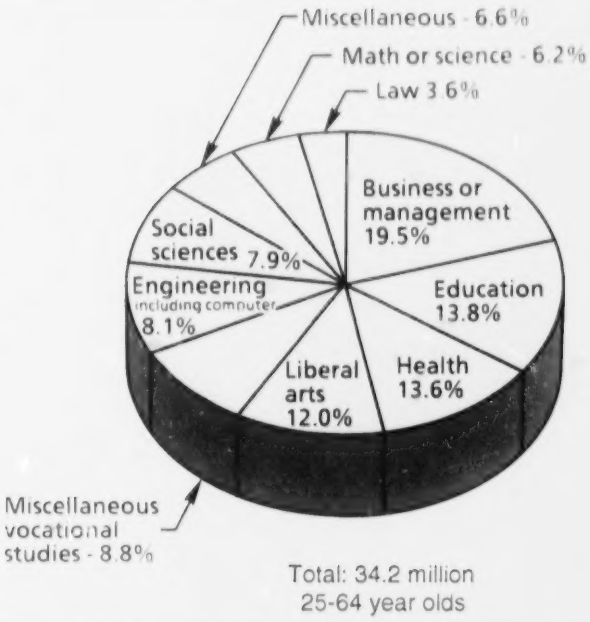


FIGURE 6. Business, education and health graduates constitute nearly half of 25 to 64 year-old degree holders (1987).

Source: U.S. Bureau of the Census, *What's It Worth? Educational Background and Economic Status: Spring 1987* (Washington: U.S. Government Printing Office, October 1990), Current Population Report, Series P-70, No. 21, p. 10.

Employer-provided training corresponds closely to current work responsibilities, but lasting relevance depends on occupational and job mobility (switching employers). Military service apparently bears little direct connection with subsequent civilian work. Two-thirds of army veterans, the only branch of the military studied to date, believed there was very little similarity between their army and civilian occupation held one to three years after separation.[27]

Relatively few workers spend their work lives in a single occupation, and mobility rates have remained consistently high for decades.[28] Less than one of six men aged 55 to 59 employed in 1987 had remained in

his current occupation for virtually his entire career (35 years or more). Median tenure was 2.[2] years, distributed as follows:

Less than 10 years	21.5%
10–19 years	19.9
20–29 years	23.5
30 or more years	35.0

Job mobility and occupational mobility are correlated because occupational mobility is much higher for individuals who change employers. However, the implications of job mobility differ from those of occupational change. When the latter occurs within a firm, the employer is likely to bear the costs, and workers encounter fewer adjustment difficulties. In some cases the government bears the costs associated with occupational changes made outside the firm, through unemployment insurance, education and training programs. Based on U.S. Bureau of Labor Statistics job mobility surveys, the average American worker is projected to hold 11 jobs during his or her lifetime. Turnover rates are highest in the early career years, but the average worker is nevertheless projected to switch jobs four or five times after age 30.[29]

Skill requirements

An assessment of the skills necessary to operate the economy can be only a rough approximation. The available evidence reinforces the need for more generalized rather than more specialized skills. There is little indication that the demand for specialized skills—whether attributable to technological or other factors—is outstripping the supply of educated workers.

Skill requirements are influenced by the abilities of the workforce, the mix of goods and services produced, the organization of work, and the technologies employed. These elements are in constant flux and are apparently subject to few fixed rules. Employers screen applicants on the basis of job experience relevant to the available opening, educational credentials and per-

sonality attributes. In fact, employers often emphasize traits such as a willingness to work, conscientiousness, cooperativeness, and honesty as much as possession of job-related skills in articulating hiring criteria. High school grades and test scores carry little weight in the hiring decision. Small and medium-sized firms sought information about transcripts or grades from less than one-sixth of applicants, although confidentiality strictures and poor cooperation by school systems undoubtedly discouraged employer requests. These firms administered tests in only 3 percent of all hiring decisions, often for secretarial positions.[50] The Supreme Court has discouraged the use of employer testing by emphasizing its discriminatory impact.

A number of studies have attempted to examine the skills used and the tasks performed at work. Based on the reports of U.S. Labor Department personnel who observed workers on the job, the dictionary of occupational titles (DOT) attempts to describe the skills, educational requirements, and prerequisite training time associated with nearly 13,000 separate occupations. Analysts have used DOT data to project future skill requirements, but the dictionary was not designed for this purpose and is inadequate for the task. In 1991 most of the data are at least a decade and a half old, and two thirds of the occupational descriptions in the latest edition (1977) were based on observations of tasks performed by two or less workers. In 1980 a National Academy of Sciences panel judged the dictionary's job content information wanting. Subsequent staff reductions of more than two-thirds do not offer promise of an improved product within the foreseeable future.[51] That occupational skill forecasters combine questionable DOT data with labor force projections—the weakest of all workforce statistics—further undermines their credibility. For example, the 1970 projection underestimated the 1985 labor force by 11 million people.

Noting that higher skilled occupations have demonstrated rapid growth rates, the U.S. Labor Depart-

ment and some analysts have argued that future demands will outstrip the supply of skilled workers. However, high growth rates in selected occupations by no means imply rapidly rising skill demands for the overall economy. Because relatively few workers are employed in many of the fastest growing occupations, the percentage increases are misleading. The best guess is that skill demands are not increasing relative to past trends.[52] In fact, since the early 1970s the influx of college-educated individuals has outpaced the increases in managerial and professional occupations. Microchip and computer technology may alter skill requirements at a more accelerated pace than previous technological innovations, but the experience to date has not borne this out. More than three fifths of workers still do not use computers on the job, including half of professionals.[53]

Current widespread deficiencies in basic skills are a much more pressing problem than possible future shortages among occupations requiring advanced education. Some 85 percent of young adults aged 21 to 25 who worked year-round full-time in 1985 reported that their jobs required reading and writing skills. Less than a tenth of 1972 high school seniors, questioned 14 years later, reported spending no time reading, writing, or using math on their current jobs.

Several studies have attempted to gain better insights into skill demands at work by examining a nonrandom sample of several hundred workers in widely diverse occupations. The findings are at best tentative, but shed some light on a murky subject. Virtually all the workers reported that their jobs required the ability to read. Half of on-the-job reading tasks involved material no more than three pages long. Workers often read in conjunction with tangible objects, which aids comprehension. This perhaps explains why workers may perform poorly on tests but adequately on the job.[54]

Changing skill demands result in occupational transformations. The U.S. Census Bureau has provided an historical classification of workers by occupation, but very little is known about changes within occupations over time. During this century the share of the workforce holding jobs requiring relatively greater skills has unquestionably increased, and this transformation is continuing. Even for some growing occupational areas—such as administrative support jobs until 1980—where more skills may not be required than in the occupations displaced, the new jobs entail more demanding literacy skills. However, the pace of change does not appear to have accelerated significantly over time, and there are no signs of changing demands outstripping workforce adaptability.

The stress of economic change should not be overestimated. While some workers lost out in the shuffle, most adapted willingly, if not eagerly, because the new opportunities usually offered more remuneration and less strenuous physical labor. The degree of change should also be placed in the context of the large number of young people joining the labor force. Unlike established workers, young employees may not perceive new skill demands as change at all. Many children today are familiar with computers. Young workforce entrants are often keenly attuned to the growing occupations that present the most promising opportunities. Because of the baby bust, young new entrants will represent a declining proportion of the total workforce. But 25 to 34 year-olds in the year 2000 will represent a substantial one fourth of the labor force aged 20 or older. Such a large cohort of young adult workers appears more than sufficient to adapt to the evolving pace of technological and occupational change.

The impact of technological change on skill requirements has attracted increasing attention during recent decades, generating much heat but little light.

A National Academy of Sciences review, echoing earlier assessments, concluded that the adoption of new technology has probably played only a modest role in displacing jobs. In fact, failure to innovate would cause greater job losses than those resulting from technological change because American industries would become less competitive and lose business at a greater rate than during the past decade. Lack of technological progress would also result in stagnating and even declining real compensation.

Employers have typically adopted new technologies slowly because of inertia and concerns about the costs and risks involved, and they normally retrain their current workforce, tending to ensure that workers have ready access to the necessary new skills. Most workers learned to operate a computer on the job, with a minimal investment of time. Although the verdict is still out regarding the effect of new technology on future skill requirements, the impact will probably be no greater than the effects of past innovations.[55] Nonetheless, displacement of workers is inevitable, but employers frequently fail to provide retraining assistance. In such cases the government should retrain the victims of technological progress.

Occupational shortages

More is known about labor shortages in specific occupations than about broader skill deficiencies. The recent popular and oft-repeated alarming views about shortages have not been based on hard evidence. "Labor markets," the Council of Economic Advisors concluded, "typically do not experience long-run imbalances but gradually adjust to changes in supply and demand."[56] Sustained occupational shortages are much less of a problem than surpluses, i.e., unemployment. Major societal and technological changes, whose timing or even occurrence is sometimes unforeseen, may precipitate skill shortages. For example, the nation faced a shortage of engineers during World War II, the immense scale of which could not easily have been predicted.

Most shortages do not materialize instantaneously. For instance, public elementary and secondary school enrollment grew by 20 million (80 percent) between 1950 and 1970, after remaining stable during the previous two decades. Although the government had no advance plans to prepare additional teachers to educate these baby boomers, the growth of instructional staff (133 percent) outpaced enrollment by the early 1950s, and the ratio of students to instructional staff dropped steadily from 28:1 in 1950 to 21:1 in 1970. Some observers have predicted future teacher shortages, but the workforce will likely have no greater difficulty adapting to future demands than to the challenge of the postwar baby boom.

A shortage of registered nurses has persisted for several decades, although a recent upturn in wages may promise relief. The unique circumstances of the RN shortage demonstrate that it is an exception proving the general rule that persistent skill shortages are rare. Nineteen of 20 RNs are women, historically subject to wage discrimination. Nursing shortages deepened when better paying opportunities opened to women after 1970, and market conditions impeded RN salary adjustments. No more than a few hospitals (where two-thirds of nurses work) dominate demand in many localities, leaving RNs little bargaining leverage. However, median real weekly earnings of full-time RNs rose by 9.5 percent in the three years ending in 1990, from $555 to $608, while the earnings of the entire workforce dropped by 3.3 percent. The increases may mean that employers are at last responding to market forces in a manner that will alleviate nursing shortages. After declining steadily between 1983 and 1988, enrollments in RN programs jumped by 25 percent in the last two years.

Engineers and scientists, though less than 3 percent of the workforce, contribute vitally to the nation's economic health. Concerns over future skill shortages among engineers and natural scientists may be mis-

placed; indeed, these occupations may face higher unemployment if military spending declines. Employment of engineers and natural scientists since 1983 (earlier comparable data are unavailable) has not kept pace with the increased number of other professional workers. However, supply has kept pace with demand. The number employed as computer and math scientists has nearly doubled in seven years:

	1983	1990	Growth rate
	(thousands)		
Total employment	100,834	117,914	16.9%
Professionals	12,820	15,818	23.4
Engineers	1,572	1,862	18.4
Computer and math scientists	465	866	87.0
Natural scientists	357	401	12.3

A rising proportion of postsecondary students is graduating with bachelor's or advanced degrees in engineering, math and computer fields, while the share with natural science degrees has dropped:

	1970–1	1980–1	1988–9
Total graduates (thousands)	1,102	1,264	1,327
Engineering and related technologies	6.4%	7.5%	8.4%
Computer science	3.2	2.7	4.4
Natural science	7.0	6.7	5.2

There is room for concern about future developments. Slackening interest in science and engineering careers, together with the poor general performance of students in the subjects that prepare them for these professions, may be a harbinger of problems.

A rising share of Ph.D. recipients are not U.S. citizens, evoking concerns over skill shortages at this level. The number of awarded doctoral degrees peaked in 1973 at 34,000 and has since remained relatively constant. Moreover, in 1960 nearly 9 of 10 recipients were American citizens, compared with 3 of 4 in 1988,

and the share of American citizens has dropped much more precipitously among engineering and physical science graduates:

	Ph.D. recipients					
	Engineering		Physical sciences		Life sciences	
	1960	1988	1960	1988	1960	1988
U.S. citizens	76.8%	46.0%	86.7%	65.1%	81.9%	76.2%
Permanent residents	6.8	9.5	2.9	5.1	3.3	5.3
Temporary residents	16.3	44.6	10.4	29.8	14.8	18.5

Similar declines have apparently occurred at the master's degree level. In recent years graduate enrollment levels of native-born Americans in engineering and in the life, physical and mathematical sciences have either plateaued or dropped, while enrollments of foreign-born candidates have continued to rise.[37]

To date an influx of foreigners working in the engineering and scientific professions may have counterbalanced slackening interest among native-born Americans, although the evidence is contradictory. The growing proportion of foreign Ph.D. degree bearers with temporary visas may be mitigated by the fact that during the past two decades the vast majority of new Ph.D recipients (citizens and foreigners combined) have reported that they planned to remain in the United States. Following receipt of an engineering or science Ph.D. degree in 1984 or 1985, 92 percent of those with permanent visas and 67 percent with temporary visas remained in this country until at least 1987. The 1990 immigration law is likely to attract more engineers and scientists and probably ease for those with temporary visas the conversion of their status to permanent residents. While the preference to remain in the United States testifies to the superior working and living conditions here, the fact remains that the benefits accruing to the United States constitute a form of "beggar thy neighbor," even though foreigners remain here of their own volition.

In 1989 the U.S. National Science Board concluded, "With the exception of engineering Ph.D.s, the scientific and engineering labor force has, in general, been nearly sufficient to meet the economy's current needs," and that past adjustments "have been generally sufficient to meet the growing demand for scientific and engineering personnel."[48] The premium placed by postsecondary schools on Ph.D. instructors may also be relaxed without doing damage to the education of undergraduates; there is no evidence that the acquisition of a Ph.D. improves the quality of teaching. Future levels of military spending following the end of the Gulf War, as yet unclear, will critically affect demand for engineering and science professions. The U.S. National Academy of Sciences estimated that one-fifth of engineers are engaged in defense work, and undoubtedly a disproportionate share of scientists are similarly employed.

Visions Without Dollars

The skills of Americans and the opportunities to use them afforded by our political, economic and social systems have unquestionably helped the United States become the world's wealthiest nation. However, the diminishing U.S. lead over our economic competitors, persistently high poverty rates, deteriorating family structure, stagnating real earnings, rising income inequality, and widespread deficiencies in educational and workplace competency in the face of growing educational attainments are extremely troubling. Pervasive national concerns about the "crisis in education"

have generated sundry prescriptions for improving the skills of the American labor force and the education system. The merits of many proposals that have emanated from presidential commissions, governors' deliberations and reports, business groups, and think tanks are beyond question, but few of their recommendations are in place because policymakers have been reluctant to pick up the tab to implement even the most needed reforms. By two to one Americans indicated that they would approve of raising their taxes to improve their schools.[39] The leading proposals involve revamping the educational system to make it more effective to prepare students for the labor market; expanding employers' responsibility for enhancing the skills of their workers; offering individuals who have failed or were failed by the school system a second chance to acquire basic skills including a mastery of the three Rs; and establishing an operationally effective labor exchange that would help match jobseekers with job vacancies.

The Bush administration agenda

On April 18, 1991 President Bush, who promised in his 1988 campaign to become "the education president," unveiled his policies for overhauling the American educational system. But it is still not clear whether he will vigorously use his office to pursue reforms: U.S. Education Department secretary Lamar Alexander pointedly described the policy as "a national strategy, not a federal program."[40] As it now stands, the President's proposal contains one grave omission, another highly controversial proposal and an attempt to raise American educational standards.

The major flaw in President Bush's educational agenda is that it almost completely ignores assistance to preschool children, although the administration recommended a modest increase in the 1992 Head Start program and Congress has committed itself to boosting the appropriation above the administration's proposal. Even with the increased funding Head Start will be able to serve only 3 of every 10 eligible poor children. It is well established that many children

brought up in impoverished homes are not ready to perform effectively in school and are frequently considered "learning disabled" by the time they enroll in the first grade or even kindergarten. The National Governors' Association recognized the need to prepare children from poor homes for school. The Committee for Economic Development, an organization of over 200 business and educational executives, has also emphasized "the development of children from their earliest stages of their lives."[41] The apparent reason for President Bush's failure to include a preschool component in his education message is that it would require the federal government to double its current outlays of over $9 billion for child care. Here as elsewhere the President's educational agenda avoids addressing the obvious need for additional funds to realize his goals.[42]

Choice—the proposal that would permit parents to enroll their children in a school of their choice—raises a different set of problems. While the details are not yet available, it would seem that the reallocation of funds would follow the children to the school their parents choose for them. This raises a long-standing controversy about separation of state and church because the proposal would entail providing public funds to parochial schools. It would also require overhauling Chapter 1, the federal program that assists educationally disadvantaged students in public elementary and secondary schools. Most of these funds are spent for hiring special teachers and the funds are allocated directly to schools. Under President Bush's proposal the funds for educating transferred children would follow them to their new schools, private or public.

The constitutional question, although unresolved, may be overcome in light of past experience. The federal government already provides assistance to religiously affiliated institutions, including Head Start in the case of preschools and Pell grants to students attending postsecondary religious schools. Considering

the present composition of the Supreme Court, the proposal would most likely overcome constitutional challenges. But the transfer of money from one school to another, whether public or private, will alone raise problems and likely necessitate additional funds. If choice is to be more than a theoretical right, transportation would have to be arranged for poor children, because their parents ability to pay for travel will be, of course, extremely limited. These transportation arrangements may involve a new kind of "busing." There is also the question of what will happen to the children who are left stranded in poor schools. Mass exodus from poor schools will probably make them even worse, while the more desirable schools will become overcrowded.[1] Clearly the choice idea has not been thought through and apparently it will create more problems than it would resolve.

Probably the potentially most promising and realizable proposal in the Bush education program involves the development of voluntary national test standards. In the absence of standards, workers and the economy suffer a shortfall in competence because the yardstick for credentials is largely completion of time in school, rather than mastery of recognized standards. Several years ago national standards would have been considered "un-American," and some educational administrators may still cling to this view. While the notion is not new and has been advocated by several prestigious commissions, President Bush's proposal should provide a stimulus for developing national standards.

Americans recognize the importance of education for occupational success, but many students seem to act as if their educational achievement and schoolwork have little relevance to their future careers. The immediate rewards of educational achievement are often slim because many employers are unwilling to hire youth fresh out of school for career-track positions, and discrimination, although illegal, remains a fact of life.

Consequently many youngsters, who tend to have limited horizons, view educational effort—and sometimes graduation itself—as marginal to their careers, and opt for paid (including illegal) work or leisure pursuits. The fact that employers tend to ignore grades and test scores, and many postsecondary schools admit high school graduates regardless of achievement, actively discourages educational effort.

National standards are necessary for practical, legal, and equity considerations. Employers have little reason to rely upon educational credentials which are not based on reasonable standards, and may represent radically different achievements from one school to the next. Rigor and consistency are also necessary to address equal opportunity challenges, which many job tests have failed to meet. Nonuniform standards penalize students who attend "tougher" schools or pursue more rigorous programs, and would encourage many to seek frivolous courses in order to boost "paper performance."

About 80 percent of adults favor standardized national tests, and 70 percent favor a national curriculum. Students themselves support the idea of high school graduation tests, including half of students who had failed such tests. A higher proportion of minority than white students endorsed graduation tests.[44]

Like choice, adoption of standardized tests raises problems and necessitates additional investments. There is a need first to determine what the tests will measure. If the standards are set at adequate levels, many students now automatically promoted will likely fail, which may in turn raise dropout rates. In the absence of extra help, students at risk may become victims of the tests. The Bush administration recommends testing 4th, 8th, and 12th graders, which should offer an opportunity to identify children at risk. Preventive and remedial assistance will require additional resources, but the Bush plan chose to ignore this need.

On the theory that every little bit helps, President Bush proposes a total added appropriation of $690 million to fund his education agenda, stating that "dollar bills don't educate children." He did not elaborate how the proposed strategy would achieve "a revolution in American education" with so little money.[45]

Other federal efforts

Youngsters from poor or single parent homes can benefit from special assistance, but the most effective approach would be to ameliorate these conditions in the first place, a task which of course must be addressed outside the school system. Programs that expand employment opportunities, raise earnings, prevent out-of-wedlock births, provide child support and child care, and secure minimally decent health care and affordable housing are desirable in their own right. They are also critical tools for achieving educational improvement and better preparation for work.[46]

Existing federal programs directed at the poor who are most in need of educational assistance require added funding if the programs are to serve all those seeking aid. In 1991 Congress boosted appropriations for preschoolers served by the Head Start program. However, the "Chapter 1" program, targeted to assist elementary and secondary students who perform poorly in school, has concentrated its limited funds on elementary pupils. As a result, aid to youngsters who require continuing help in secondary schools is normally unavailable.

In addition to federal education programs, the government also funds employment and training programs for low income, deficiently educated and physically handicapped persons at an annual cost of about $6 billion. Adjusted for inflation this amount has shrunk by over two thirds compared to peak spending levels in 1978. The Job Training Partnership Act (JTPA) is the major vehicle for this activity. The largest program under JTPA enrolls about 350,000 persons annually in classroom training, but because of limited

resources the program offers on average only 415 hours (including nonproductive time) of classroom instruction which prepares trainees for low level jobs. Yet the employment rates and earnings of former participants marginally exceed that of comparable nonparticipants. In contrast, the Job Corps provides annually some 100,000 disadvantaged youth intensive training averaging seven months. Except for the Job Corps, governmental employment programs provide very little remedial educational assistance despite the limited literacy of many applicants. Literacy deficiencies, if not remedied, may restrict performance of some or relegate them to the lowest-level jobs or to extended spells of involuntary idleness. Even providing only cursory services, the employment and training programs enroll no more than about 1 in 15 potentially eligible individuals.[47]

The U.S. Defense Department is the largest single source of employer training. In fiscal 1990 the military spent $18.3 billion for training, including trainees' salaries. Six of seven young military personnel questioned in 1979 had obtained formal training beyond basic training, averaging 15.5 weeks and ranging between 9 weeks for the army to 21 weeks for the air force.[48] The unique nature of military service explains the Defense Department's relatively high training investment. The military enlists mostly unskilled young adults, it has a good assurance that their service will last several years, job duties are uniform for many occupations, and a large workforce permits economies of scale in providing training, appear to offer a positive return on the investment not only to the individuals benefiting from the training but also to society at large.

The federal government also offers tax credits to enhance job and training opportunities for the unskilled and poorly educated. Some analysts have advocated a universal tax credit to boost training by firms. However, such a credit could easily become a subsidy to employers with few if any ensuing benefits

to the presumed trainees, because firms could reclassify routine expenditures as training.

Employer training

Annual data on employer expenditures for formal training are guesstimates ranging from $30 to $60 billion, and more than double that amount for informal on-the-job training.[9] Although commonly cited, these figures are based upon isolated case studies, surveys with miniscule response rates, or assumptions grounded upon speculation. Most analysts agree that employers target training toward managerial and professional workers, but skimp on training those in less well paid occupations.

On-the-job training (OJT) has received much attention, but surveys indicate that formal company training is limited. Only 6 percent of employees aged 22 to 29, tracked over a nine year period ending in 1987, had ever enrolled in a company training program lasting more than one month. As workers progress in their careers, the likelihood of company training increases but the investment remains of short duration. The national longitudinal study of the 1972 high school class examined employer-provided training 14 years later. The survey found that nearly half of the respondents obtained formal on-the-job training in their current or most recent jobs. The training was limited typically to a part time, several week session, and for the few who obtained tuition benefits the average subsidized school program approximated a single one semester course.

In only 15 of hundreds of specialized occupations do a substantial proportion of workers cite company programs as a primary source of their training to qualify for the job, and many of these are in the public sector. A third to one half of police officers and detectives, insurance salespersons, firefighters, tool and die makers, precision inspectors and testers, plumbers, and bus drivers qualified for their jobs following a formal employer training program.

Apprenticeship, the traditional means of learning a trade, has contracted sharply in this century. In 1987 only 1 percent of workers aged 22 to 29 were currently or had been in apprenticeship programs. Most trainees in such programs begin their training period in their early 20s. Employers pay the apprentices wages while they are undergoing training. Apprenticeship is concentrated in the building trades and pays off well to those who complete their training.

Because of the limited career options available to noncollege youth, some have recommended U.S. adoption of an apprenticeship system similar to that in Germany.[30] The recommendations come from diverse quarters, but they all share a remarkable lack of specificity. Replacement of the current upper secondary school system for the noncollege-bound with some kind of apprenticeship system would require a multibillion investment by employers.[31] One private commission, headed by former U.S. Labor Department secretaries William Brock and Ray Marshall, recommended a one percent tax on wages, amounting to $27 billion, paid by employers to develop a training system for the United States.[32] But with taxpayers and workers currently paying for most preparatory training, firms have little incentive and have shown no inclination to substantially boost their own investment, despite continued complaints about unqualified workers.

Matching job seekers with job vacancies

Filling job vacancies expeditiously and inexpensively benefits employers and potential employees alike. Employers reap savings when production interruptions are reduced and employees benefit from increased income as well as from shorter job searches. Moreover, society as a whole benefits when the unemployed become taxpayers.

In the dynamic United States economy, many jobs remain vacant even if qualified individuals are looking for work. Private-sector mechanisms, such as employment agencies, do facilitate the jobmatching process,

but they serve mostly workers who can afford the services or employers who are willing to pay employment agencies to find qualified workers. The poor are unable to pay for job-search assistance and for-profit employment agencies typically do not list jobs for the unskilled. Even an effective education and training system requires formal and free job-matching arrangement not only to low-wage and unskilled workers, but for all job seekers.

The federal-state employment service (also known as the job service) attempts to match available workers with vacant jobs. Because of its limited funding, the employment service does not operate so much as an active placement office but more as a passive matcher of job openings with job seekers. The service collects information from job applicants and refers applicants to employers. It fills mostly low-paying, short-time jobs.

The employment service should improve the flow of information between employers and jobseekers, but it performs this task poorly probably because of its focus on filling low-skilled jobs and because employers may want to control the applicant pool. An effective public employment service would require the employment service to change its image in order to attract employers to list more job openings. This could be achieved only if the service referred qualified job applicants and if employers would register the job opening with the employment service. Such reforms would require expanded appropriations for the service.

The Task Ahead

Americans are unlikely to adopt a system entailing rigid stratification at a young age, nor should they. However, the proposed reforms, if implemented, would enhance and more tightly bind the school/work connection and better prepare Americans for today's labor market. Effective education requires working toward a substantive goal. Federal and state governments, school authorities, academic experts, employers, and labor groups (including, of course, teacher organizations) should forge a consensus on the minimum knowledge and skills which graduates at all levels of education should master and assure adherence to these standards. The absence of such a consensus has resulted in an overemphasis on credentials instead of achievement, and a tragic waste of human resources—especially in the case of youngsters who attend school from childhood to adolescence and emerge functionally illiterate.

Clearly the current education and training system that prepares Americans for the work place falls short of optimal performance. The system serves reasonably well the top quartile of the population who attain a college degree. A larger proportion of America's youth, however, falls by the wayside without completing a high school education or are functionally illiterate even with a diploma. Arrangements to help the transition of these youths from school to work are woefully inadequate, leaving the youths to flounder in the labor market. When they obtain an entry level job, they usually receive little or no training and are relegated to a lifetime of low-paying occupations with frequent spells of forced idleness.

A comprehensive reform of the present system leading to expanded economic growth and enhanced opportunities for individuals would carry a high price tag. A sustained and broadly based national drive involving all levels of governments and private organizations would be necessary to bolster the education and training systems. Forging a consensus on the mini-

mum knowledge and skill levels needed for the efficient and equitable operations of America labor markets is essential to the process. An effective strategy would require formulating substantive goals and ensuring that adequate public and private resources are available to implement the agreed upon objectives.

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